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# DOE's Office of Energy Efficiency and Renewable Energy (EERE): The FY2017 Budget Request

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# Summary

The U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE) is the principal government agency responsible for renewable energy technologies and energy efficiency efforts. EERE works with industry, academia, national laboratories, and others to conduct research and development (R&D) and to issue grants to state governments. EERE oversees nearly a dozen technologies and programs—from vehicle technologies to solar energy to advanced manufacturing to weatherization and intergovernmental programs—each having its own respective mission and program goals.

EERE receives its funding from the annual energy and water development (E&W) appropriations bill. For FY2017, the Administration is requesting both discretionary and mandatory funding for EERE. The Administration's FY2017 budget request for EERE is $2.9 billion of discretionary funding plus an additional $1.3 billion of mandatory funding for a new program, bringing the total FY2017 budget request to $4.2 billion. The total $4.2 billion request is an increase of $2.2 billion (104%) from the enacted FY2016 level of $2.1 billion (the Consolidated Appropriations Act, 2016; H.R. 2029; P.L. 114-113, Division D). The $2.9 billion of discretionary funding requested is an increase of $829 million (40%) from the FY2016 enacted level of $2.1 billion. The bulk of the discretionary portion of the request would be split among three areas: nearly 32% for energy efficiency programs, about 21% for renewable energy programs, and about 29% for sustainable transportation programs. The discretionary funding portion of the EERE request is nearly 10% of the $30.2 billion discretionary portion of the FY2017 request for DOE.

The EERE budget request includes new and ongoing efforts that range in scale and cost. For instance, EERE would continue to support the following initiatives: the EV Everywhere Grand Challenge, concerning the adoption and use of plug-in electric vehicles; the SunShot Initiative to make solar energy cost-competitive by 2020; and the establishment of energy efficiency requirements for equipment and appliances, among other things. With the discretionary funding, EERE requests $40 million to establish a new research and development program focused on reducing the climate impacts of heating, ventilation, and air conditioning systems. Further, EERE requests $215 million for a new Crosscutting Innovation Initiatives program that has several goals, including the establishment of regionally focused clean energy innovation partnerships across the country and the acceleration of next-generation clean energy technology pathways.

A relatively significant new measure contained in the budget request is $1.3 billion in mandatory funding for EERE's involvement in the Administration's 21st Century Clean Transportation System—a new multiagency initiative to build a clean transportation system. Regarding this effort, EERE reports that it will "expand investment in transportation technologies of the future; establish regional fueling infrastructure to support the deployment of low-carbon fuels; and accelerate the transition to a cleaner vehicle fleet."

Some in Congress, along with renewable energy and energy efficiency proponents and opponents, and others may express concern about the EERE budget request. Particular areas of concern may be the 40% increase in requested discretionary funds, EERE involvement in the 21st Century Clean Transportation System, and the mandatory funding requested for this involvement, among other issues.

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# Introduction

This report discusses the FY2017 budget request for the U.S. Department of Energy's (DOE's) Office of Energy Efficiency and Renewable Energy (EERE). The Administration requests both discretionary funding ($2.9 billion) and mandatory funding ($1.3 billion) for EERE for FY2017, for a total of $4.2 billion.[1] The total $4.2 billion request is an increase of $2.2 billion (104%) from the enacted FY2016 level of $2.1 billion. The Administration's discretionary portion of the FY2017 request is 40% higher than the FY2016 enacted level ($2.1 billion).

The funding level Congress decides to provide could impact goals set by EERE, including sustainable transportation goals (e.g., vehicle electrification and biofuels), renewable energy goals (e.g., grid modernization for solar energy, enhanced geothermal technologies), and energy efficiency goals (e.g., establishment of one additional Clean Energy Manufacturing Innovation Institute). It also could affect EERE's involvement in the 21st Century Clean Transportation Plan and EERE assistance with industry competitiveness, among other things. This report does not discuss the opportunities, challenges, economic value, or commercial status of the various renewable energy technologies and energy efficiency initiatives selected by EERE, nor does it delve into the goals of the individual EERE programs or congressional oversight of certain EERE issues.[2]

# Background

## EERE

EERE leads the DOE's effort to accelerate development and facilitate deployment of energy efficiency and renewable energy technologies and market-based solutions intended to strengthen U.S. energy security, environmental quality, and economic vitality. EERE is led by the Assistant Secretary for Energy Efficiency and Renewable Energy, and it is organized into four offices: Office of Transportation, Office of Renewable Power, Office of Energy Efficiency, and Office of Operations.[3] EERE reports that it invests in only what it considers to be the highest-impact activities. EERE collaborates with industry, academia, national laboratories, and others to develop technology-specific road maps and then focuses on early stage research and development (R&D), technology validation and risk-reduction activities, and the reduction of market barriers to the adoption of market-ready new technologies. EERE also manages a portfolio of programs that support state and local governments, tribes, and school leaders. In addition, EERE oversees the National Renewable Energy Laboratory (NREL)—the only national laboratory solely dedicated to researching and developing renewable energy and energy efficiency technologies.[4]

[1] U.S. Department of Energy (DOE), *FY2017 Congressional Budget Request*, vol. 3 (February 2016).

[2] For more information on clean energy, energy efficiency, and EERE programs, see CRS Report R44004, *DOE's Office of Energy Efficiency and Renewable Energy: FY2016 Appropriations*, by (name redacted), CRS Report R40913, *Renewable Energy and Energy Efficiency Incentives: A Summary of Federal Programs*, by (name redacted) and (name redacted), CRS Report RS22858, *Renewable Energy R&D Funding History: A Comparison with Funding for Nuclear Energy, Fossil Energy, and Energy Efficiency R&D*, by (name redacted), and CRS Report R42147, *DOE Weatherization Program: A Review of Funding, Performance, and Cost-Effectiveness Studies*, by (name redacted)

[3] DOE was established under the Department of Energy Organization Act of 1977 (P.L. 95-91). Section 203 of the act identifies eight assistant secretary positions and the functions they are to cover. EERE Organization Chart, February 12, 2016.

[4] There are other national laboratories that conduct energy efficiency and renewable energy work, such as Lawrence (continued...)

# FY2011-FY2016 Appropriations

EERE receives its appropriations from the annual energy and water development (E&W) appropriations bill.[5] For each of the last several years, DOE has requested increased funding to support EERE programs and objectives, and Congress's response has been to provide funding at levels lower than what was requested. Appropriations for EERE have averaged $1.86 billion annually for the last six years in current dollars (see **Table 1**). The appropriations are split into four major categories: sustainable transportation, energy efficiency, renewable energy, and corporate support (e.g., program administration). From FY2011 to FY2016, approximately two-thirds of the appropriations were split between sustainable transportation and energy efficiency, while close to a quarter of the appropriations were spent on renewable energy and approximately 12% was spent on corporate support.

# FY2017 Request

DOE has requested $4.2 billion to support EERE programs and objectives for FY2017 ($2.9 billion in discretionary funding and $1.3 billion in mandatory funding). The total $4.2 billion request is an increase of $2.2 billion (104%) from the enacted FY2016 level of $2.1 billion.

## Discretionary Portion of Request

The discretionary portion of the request, $2.9 billion, is an increase of $829 million (40%) from the FY2016 enacted level of $2.1 billion (see **Table 1**).[6] The discretionary portion of the EERE FY2017 request is approximately 10% of the discretionary portion of the overall DOE FY2017 request of $30.2 billion.[7] The FY2017 EERE request would allocate approximately 61% of the appropriations to sustainable transportation and energy efficiency, combined. However, energy efficiency would receive slightly less in its share of the two categories combined than it did in FY2016 (32% in the FY2017 request, as compared with 35% in FY2016). The FY2017 request allocates close to 21% and 10% of the request for renewable energy and corporate support, respectively.

Some of the goals, highlights, and major changes presented in the EERE FY2017 request, as reported by DOE, include the following:

- Sustainable Transportation [$852.9 million]
  - Continues support for the Electric Vehicle (EV) Everywhere Grand Challenge by reducing the combined battery and electric drive system costs of a plug-in electric vehicle by up to 50% (by 2022, from a 2012 baseline).[8] [$282.7 million]

(...continued)

Berkeley National Laboratory and Oak Ridge National Laboratory.

[5] The E&W appropriations bill has funded all DOE offices and programs since 2005. Prior to 2005, DOE received its appropriations from both the E&W appropriations bill and the Interior, Environment, and Related Agencies appropriation bill.

[6] DOE, *FY2017 Congressional Budget Request*, vol. 3 (February 2016).

[7] The FY2017 total discretionary funding request for DOE is $30.2 billion and the mandatory portion is $2.3 billion, for a total of $32.5 billion. DOE, *FY2017 Summary Control Table by Appropriation*, February 2016.

[8] The EV Everywhere Grand Challenge is a DOE-wide initiative that seeks to enable the United States to produce a (continued...)

- Continues support for the SuperTruck II initiative started in FY2016 to research, develop, and demonstrate a suite of technologies with the goal of improving the freight-hauling efficiency of heavy-duty Class 8 long-haul vehicles by 100% by 2020 (with respect to comparable 2009 vehicles) and demonstrating applicability of these technologies to heavy-duty regional-haul vehicles as well.[9] [$60 million]
- Explore opportunities for energy efficiency above the program's traditional vehicle-level focus at the overall transportation system level with the Transportation as a System (TAS) initiative by evaluating how transportation assets, travelers, and the transportation system interact and influence each other using multiscale, multisystem models, with the longer-term goal of optimizing efficiency of the transportation system. [$20 million][10]
- Support the conversion of cellulosic and algal-based feedstocks to bio-based gasoline, diesel, and jet fuel at a target cost of $3.00 per gallon of gasoline equivalent (gge) by the end of 2017, with an emphasis on drop-in hydrocarbon biofuels from nonfood sources.[11] [$30 million for the Advanced Algal Systems subprogram]
- Develop a Synthetic Biology Foundry to improve efficiencies in the conversion of biomass to fuels and products.[12] [$35 million]
- Support reduced cost and increased durability of a fuel cell system and invest in R&D for technologies that can lower the cost of hydrogen from renewable resources to less than $4.00/gge by 2020.[13] [$35 million for fuel cell R&D; $44.5 million for hydrogen fuel R&D]

- Renewable Energy [$620.6 million]
  - Support the SunShot Initiative goal of making solar power cost-competitive without subsidies by 2020, equivalent to a cost of solar power of $0.06 per kilowatt-hour, and support solar grid integration.[14] [$43 million for concentrating solar power; $83 million for systems integration]

(...continued)

wide array of plug-in electric vehicle models, including plug-in hybrids and all-electric vehicles, that are as affordable and convenient as gasoline-powered vehicles by 2022.

[9] This initiative follows the initial SuperTruck program established in 2009 with a challenge by DOE to truck manufacturers and suppliers to improve freight efficiency by 50% compared to a baseline vehicle, among other things.

[10] DOE reports that "There is no program within DOE's transportation portfolio directly exploiting these opportunities." DOE, *FY2017 Congressional Budget Request*, vol. 3 (February 2016), p. 20.

[11] Drop-in biofuels are generally described as biofuels that are indistinguishable from conventional petroleum-based fuels that may be used with existing infrastructure with no changes. Funding proposed to be used for cellulosic conversion efforts is not provided as a separate line item in the DOE budget request. For more information on the Advanced Algal Systems subprogram, see Ibid., p. 58.

[12] Ibid., pp. 51 and 60.

[13] A fuel cell uses the chemical energy of hydrogen or another fuel to cleanly and efficiently produce electricity. Ibid., p.71.

[14] Established in 2011, the SunShot Initiative conducts research, manufacturing, and marketing to make solar energy resources in the United States more affordable and accessible. Ibid., pp. 102 and 107.

- Issue a competitive solicitation to establish an Offshore Wind R&D Consortium to accelerate fundamental R&D for offshore wind-specific technology barriers.[15] [$25 million]
- Competitively fund new R&D projects for new stream reach development for innovative hydropower designs and construction methods.[16] [$7.8 million]
- Commence procurement and construction for the critical infrastructure needed for an open-water, fully energetic, grid-connected wave energy test facility to assist with the development of marine and hydrokinetic technologies.[17] [$20 million]
- Support research, development, and demonstration activities for a hydrothermal subprogram subsurface initiative focusing on technologies that provide for effective, adaptive, and safe control of fractures and fluid flow.[18] [$33 million]

- Energy Efficiency [$919 million]
  - Establish one additional Clean Energy Manufacturing Innovation Institute (CEMI) [$14 million] and continue support for five existing CEMIs [$70 million].[19]
  - Continue to support activities that assist and enable federal agencies to meet aggressive energy, water, greenhouse gas, and other sustainability goals.
  - Establish a Low-Global Warming Potential (Low-GWP) Advanced Cooling (HVAC) R&D funding opportunity announcement for advanced cooling and heating technologies.[20] [$40 million]
  - Create a Metropolitan Systems initiative that enables the use of historic and real-time, data-driven tools to support the design and development of low-energy, resilient infrastructure that will help U.S. cities meet their climate and energy targets.[21] [$15 million]
  - Support appliance and equipment standards.[22]
  - Provide access to home weatherization services for low-income households across the country to reduce their income spent on energy.[23]

[15] Ibid., p. 130.

[16] New stream reach development is hydropower development on U.S. stream segments that do not currently have hydroelectric facilities. For more information, see DOE, *New Stream-reach Development: A Comprehensive Assessment of Hydropower Energy Potential in the United States*, April 2014; DOE, *FY2017 Congressional Budget Request*, vol. 3 (February 2016), p. 159.

[17] U.S. Department of Energy, *FY2017 Congressional Budget Request*, vol. 3 (February 2016), p. 163.

[18] Ibid., p. 181.

[19] DOE reports that the specific technical topic for the additional Clean Energy Manufacturing Innovation Institute will come from the advanced manufacturing challenges identified on page 185 of the 2015 DOE Quadrennial Technology Review. Ibid., p. 200.

[20] Ibid., p. 223.

[21] Ibid., p. 240.

[22] Ibid., p. 242.

[23] Weatherization services include a wide variety of energy efficiency measures that encompass the building envelope, its heating and cooling systems, its electrical system, and electricity-consuming appliances (e.g., installing insulation, sealing ducts). Ibid., p. 251.

- Establish the Cities, Counties, and Communities Energy Program (3C Energy Program) to provide technical assistance and competitively awarded funds to catalyze more extensive clean energy solutions in community development and revitalization efforts.[24] [$26 million]

Other EERE initiatives include technology-to-market activities (e.g., National Incubator Initiative for Clean Energy) and international activities (e.g., expanding the number of Chinese cities using DOE's low-carbon planning tools and conducting demonstration projects featuring low-carbon technologies from U.S. companies). Additionally, EERE would establish a new crosscutting innovation initiative program introduced as a separate line item in the EERE budget table. The program would focus on providing funding for research, development, and demonstration activities, with the goal of strengthening regional clean energy innovation ecosystems, accelerating next-generation clean energy technology pathways, and encouraging clean energy innovation and commercialization collaborations between the National Laboratories and American entrepreneurs.[25] Approximately 51% of the $215 million requested for the crosscutting innovation initiative would be spent on regional energy innovation partnerships.[26]

## 21st Century Clean Transportation Program

A multiagency effort to be funded at $320 billion over 10 years, the 21st Century Clean Transportation program aims to be a key step in "making smart and strategic investments to create a cleaner, more sustainable transportation system," according to the Administration.[27] The program is to be funded by both a new fee paid by oil companies—a $10 per barrel fee on oil gradually phased in over five years—and "one-time revenues from pro-growth business tax reform."[28] The Administration states that some benefits of the proposed plan include carbon pollution reduction, economic strengthening, and transportation expansion.

The EERE FY2017 budget request includes $1.3 billion of mandatory funding to support the program. More than half, approximately 56%, of the funding would be spent on deployment of low-carbon fueling infrastructure. DOE reports that EERE will seek to support this effort with $11.3 billion over 10 years.[29] EERE participation in the program includes the following activities.[30]

- Develop regional low-carbon fueling infrastructure, including charging stations for electric vehicles, biofuels, hydrogen, and other low-carbon options in partnership with others that take into account the unique economies, resources, and development needs of different regions. [$750 million]

[24] Ibid., p. 260.

[25] Ibid., p. 295.

[26] DOE reports the regional clean energy innovation partnerships will "fund RD&D to address clean energy challenges specific to regional energy resources, customer needs and innovation capabilities of various regions of the country." Ibid., p. 299.

[27] The White House, Office of the Press Secretary, "FACT SHEET: President Obama's 21st Century Clean Transportation System," press release, February 4, 2016. Other agencies that have requested funding for the Clean Transportation Plan include the U.S. Department of Transportation and the U.S. Environmental Protection Agency.

[28] Ibid.

[29] U.S. Department of Energy, "FY2017 Department of Energy Budget Request Fact Sheet," February 2016.

[30] U.S. Department of Energy, *FY2017 Congressional Budget Request*, vol. 3 (February 2016), p. 310.

- Conduct R&D to accelerate cutting the cost of battery technology and establish public-private partnerships to achieve lowest carbon end-to-end intermodal transport for freight and fleets. [$200 million]
- Establish a smart mobility research center that will investigate the intersection of information and communication technologies, vehicle technologies, low carbon fuels, and disruptive transportation business models with the goal of reducing overall system level greenhouse gas emissions and petroleum consumption. [$200 million]
- Conduct R&D that focuses on transformational developments that address technical barriers in biofuel feedstock logistics, lower conversion costs, enhanced economics of biofuel production by focusing on high value coproducts, and the certification of new fuel pathways. [$100 million]
- Accelerate the transition to a cleaner vehicle fleet by issuing challenge grants to encourage cleaner state, tribal, and local government vehicle fleets. [$85 million]

# Legislative Issues

The Administration is requesting significantly more funding for EERE compared to the FY2016 enacted appropriations—at least an $829 million increase, and possibly a $2.1 billion increase if the mandatory funding request is taken into account. The funding requested would support numerous programs and activities that could have various impacts. The $1.3 billion in mandatory funding requested to support the 21st Century Clean Transportation Plan is part of a multiagency effort that depends on the enactment of a new revenue source. It could be a significant undertaking for EERE to implement the clean transportation plan's activities in addition to current responsibilities given that the funding for the plan is 64% of the FY2016 EERE enacted appropriations. In addition, it is possible that the plan may involve efforts previously dismissed by Congress. For instance, EERE states that it will use the mandatory funding, in part, to "establish regional fueling infrastructure to support the deployment of low-carbon fuels." If EERE considers blender pumps to be a part of this infrastructure, Congress rejected this effort with the 2014 farm bill (P.L. 113-79) by forbidding the use of Renewable Energy for America Program (REAP) funds to support blender pump installation.[31] Congress may want to examine what impact such a program may have on clean transportation expansion, clean energy sources, or conventional energy sources; how quickly such a program may be implemented; and how effective such a program would be given its scope and that multiple participants—government and others, with various objectives—need to be involved to achieve the proposed outcomes.

[31] Blender pumps are fuel dispensers that draw fuel from two separate storage tanks and can dispense preprogrammed blends of those two fuels. For more information, see CRS Insight IN10361, *USDA Blender Pump Initiative to Expand Availability of Higher-Level Ethanol Blends*, by (name redacted) .

**Table 1. EERE FY2011-FY2016 Enacted Appropriations and FY2017 Budget Request**

(in millions of current dollars)

| | FY2011 Enacted | FY2012 Enacted | FY2013 Current | FY2014 Enacted | FY2015 Enacted | FY2016 Enacted | FY2017 Request |
|---|---|---|---|---|---|---|---|
| *EERE, Total [Discretionary Funding]* | *1,795.6* | *1,809.6* | *1,691.8* | *1,901.7* | *1,914.2* | 2,069.2 | 2,898.4 |
| **Sustainable Transportation** | **580.7** | **634.0** | **584.2** | **615.3** | **602.0** | **636.0** | **852.9** |
| Vehicle Technologies | 300.0 | 330.0 | 303.2 | 289.9 | 280.0 | 310.0 | 468.5 |
| Bioenergy Technologies[a] | 182.7 | 200.0 | 185.2 | 232.4 | 225.0 | 225.0 | 278.9 |
| Hydrogen and Fuel Cell Technologies | 98.0 | 104.0 | 95.8 | 93.0 | 97.0 | 101.0 | 105.5 |
| **Renewable Energy** | **411.5** | **480.6** | **444.9** | **449.8** | **456.0** | **478.1** | **620.6** |
| Solar Energy | 263.5 | 290.0 | 269.1 | 257.2 | 233.0 | 241.6 | 285.1 |
| Wind Energy | 80.0 | 93.6 | 86.1 | 88.2 | 107.0 | 95.5 | 156.0 |
| Water Power | 30.0 | 59.0 | 54.7 | 58.6 | 61.0 | 70.0 | 80.0 |
| Geothermal Technologies | 38.0 | 38.0 | 35.0 | 45.8 | 55.0 | 71.0 | 99.5 |
| **Energy Efficiency** | **580.4** | **494.0** | **535.4** | **617.8** | **642.0** | **721.0** | **919.0** |
| Advanced Manufacturing[b] | 108.2 | 116.0 | 114.3 | 180.6 | 200.0 | 228.5 | 261.0 |
| Building Technologies | 210.5 | 220.0 | 204.6 | 178.0 | 172.0 | 200.5 | 289.0 |
| Federal Energy Management Program | 30.4 | 30.0 | 28.3 | 28.3 | 27.0 | 27.0 | 43.0 |
| Weatherization and Intergovernmental Program[c] | 231.3 | 128.0 | 188.2 | 231.0 | 243.0 | 265.0 | 326.0 |
| Weatherization Assistance Program | 171.0 | 65.0 | 128.9 | 171.0 | 189.6 | 211.6 | 225.0 |
| Training and Technical Assistance | 3.3 | 3.0 | 2.8 | 3.0 | 3.0 | 3.0 | 5.0 |
| NREL Site-Wide Facility Report | | | | — | 0.4 | 0.4 | 0.0 |
| State Energy Program Grants | 50.0 | 50.0 | 47.1 | 50.0 | 50.0 | 50 | 70.0 |
| Local Technical Assistance Program | | | | — | — | | |
| **Croscutting Innovation Initatives** | | | | | | **0.0** | **215.0** |
| **Corporate Support[d]** | **253.0** | **216.4** | **209.0** | **231.6** | **237.0** | **238.0** | **290.9** |
| Facilities and Infrastructure | 11.7 | 26.4 | | 46.0 | 56.0 | 62.0 | 92.0 |
| Use of Prior-Year Balances | | | -81.6 | -2.4 | 0.0 | 0.0 | 0.0 |
| Rescissions | -30.0 | -15.4 | 0.0 | -10.4 | -22.8 | -3.8 | 0.0 |
| *EERE, Total [Mandatory Funding]* | | | | | | | |
| 21st Century Clean Transportation Plan Investments | | | | | | 0.0 | 1,335.0 |
| *EERE, Total [Discretionary + Mandatory Funding]* | | | | | | 2,069.2 | 4,233.4 |

**Sources:** U.S. Department of Energy, *FY2017 Congressional Budget Request*, vol. 3 (February 2016); P.L. 114-113 Division D; H.Rept. 114-91; H.Rept. 113-486; DOE, *FY2015 Budget Request* vol. 3 (March 2014) (to obtain the FY2013 appropriations that DOE identifies as FY2013 current, or the enacted amount plus or minus any adjustments made since the appropriations bill became law); H.Rept. 112-462; and H.Rept. 112-118.

**Notes:** EERE = DOE's Office of Energy Efficiency and Renewable Energy; NREL = National Renewable Energy Laboratory.

a. Biomass & Biorefinery Systems Research and Development, renamed Bioenergy Technologies in FY2014.
b. Industrial Technologies, renamed Advanced Manufacturing in FY2014.
c. The Weatherization and Intragovernmental Program included $7 million for tribal energy activities for FY2011, $10 million for FY2012, and $9.4 million for FY2013.
d. Corporate support includes facilities and infrastructure, program direction, and strategic programs.

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